Meningococcal Disease

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To identify persons who have been significantly exposed to the index case, in order to recommend antibiotic prophylaxis (chemoprophylaxis) and to inform them about signs and symptoms of illness.
2. Under very rare circumstances, to recommend prophylactic immunization in a defined population or community.

B. Legal Reporting Requirements

1. Health care providers: **immediately notifiable to local health jurisdiction.**
2. Hospitals: **immediately notifiable to local health jurisdiction.**
3. Laboratories: *Neisseria meningitidis* notifiable to local health jurisdiction within 2 work days; specimen submission required.
4. Local health jurisdictions: notifiable to Washington State Department of Health (DOH) Communicable Disease Epidemiology Section (CDES) within 7 days of case investigation completion or summary information required within 21 days.

C. Local Health Jurisdiction Investigation Responsibilities

1. Because of the potential for transmission of this serious infection, immediate public health action is required to identify and provide chemoprophylaxis for contacts of cases. Identify contacts and recommend prophylaxis within 24 hours of notification of the case.
2. If the case is lab-confirmed, ensure that the isolate is forwarded to the Washington State Public Health Laboratory (PHL).
3. Report all confirmed, probable and suspect cases (see definitions below) to CDES. Complete the meningococcal disease case report form (http://www.doh.wa.gov/notify/forms/mening.doc) and enter the data into the Public Health Issues Management System (PHIMS).

2. THE DISEASE AND ITS EPIDEMIOLOGY

Neisseria meningitidis is a leading cause of bacterial meningitis in the United States. Disease incidence is highest in late winter to early spring. It is highest in children less than 5 years old, with a peak incidence in children under one year of age.

A. Etiologic Agent

Neisseria meningitides are gram-negative diplococcal bacteria. Serogroups A, B, C, Y, and W-135 cause almost all invasive disease worldwide. Among adolescents and adults, approximately two thirds of cases are caused by serogroups C, Y, or W-135, while in infants, approximately 50% of cases are caused by serogroup B. Serogroup A is rare in the United States.

B. Description of Illness

Invasive meningococcal disease most commonly presents as meningitis, meningococcemia, or both. Symptoms of meningococcal meningitis include acute onset of fever, headache, and stiff neck, often accompanied by nausea, vomiting, photophobia, and altered mental status. Symptoms of meningococcemia (i.e., blood infection) include acute onset of fever often accompanied by hypotension and shock, and may include a petechial or purpuric rash, purpura fulminans, and multiorgan failure.

Neisseria meningitidis also presents as pneumonia (5–15% of cases), arthritis (2%), and epiglottitis (< 1%). Up to 12% of infections are fatal, even with appropriate antibiotic treatment, and mortality in adolescents approaches 25% nationwide. Sequelae associated with meningococcal disease occur in as many as 20% of survivors and include hearing loss, neurologic disability, digit or limb amputations, and skin scarring.

Asymptomatic colonization of the upper respiratory tract provides the source from which the organism is spread. *N. meningitidis* organisms are carried in the nasopharynx of about 5–10% of the healthy population. Carrier rates of up to 25% have been documented in some groups in the absence of any cases of meningococcal disease. Less than 1% of those colonized develop invasive disease. Therefore, colonization is common, but invasive disease is very rare. The exact mechanism that allows the penetration of meningococci from the nasopharyngeal membranes into the blood is unknown, but a recent upper respiratory tract infection or exposure to smoke in one's environment may facilitate invasion. Risk groups for invasive meningococcal disease include infants and young children, household and other close contacts of infected persons, residents in congregate settings (e.g., military recruits, college students living in dormitories), and microbiologists working with isolates of *N. meningitidis*.

C. Meningococcal Disease in Washington

DOH has received between 40 and 80 reports of meningococcal disease annually during recent years. During 1987–2006, 1374 meningococcal isolates from Washington patients were serogrouped. Of these, 60% were serogroup B, 25% were serogroup C, 13% were serogroup Y and 2% were serogroup W-135.

D. Reservoirs

Humans are the only reservoir.

E. Modes of Transmission

Transmission occurs through respiratory droplets or through direct contact with nasopharyngeal secretions from a colonized person – symptomatic or otherwise. Close contacts of cases (e.g., household members or child care contacts) are at increased risk of becoming colonized/infected and developing illness. The attack rate for household contacts of cases is 500–800 times the rate for the general population. Risk of disease in close contacts is highest during the 10-day period following exposure.

F. Incubation Period

The incubation period is usually 3 to 4 days, but may range from 2 to 10 days.

G. Period of Communicability

Persons are infectious as long as meningococci are present in nasal or pharyngeal secretions. Cases are infectious from the time they are exposed until 24 hours after initiation of treatment or chemoprophylaxis with appropriate antibiotics. Contacts exposed to the patient more than 7 days before his/her onset of illness are not at significant increased risk.

H. Treatment

Penicillin G, administered intravenously every 4 to 6 hours, is the therapy of choice for invasive disease. Third generation cephalosporins are also used. Depending on the antibiotic used, therapy for invasive disease may *not* eradicate the organism from the nasopharynx, and chemoprophylaxis may also be required. For chemoprophylaxis recommendations, see Section 6.

3. CASE AND CONTACT DEFINITIONS

A. Clinical Description

Meningococcal disease manifests most commonly as meningitis and/or meningococcemia that may progress rapidly to purpura fulminans, shock, and death. However, other manifestations might be observed, as described in part 2B.

B. Case Classifications (2005 CDC Case Definitions)

1. *Suspect*:

- Clinical purpura fulminans in the absence of a positive blood culture, or
- A clinically compatible case with a Gram stain showing gram-negative diplococci on a specimen collected from a normally sterile site (e.g., blood or CSF).

2. *Probable*: A clinically compatible case that has either:

- Evidence of *N. meningitidis* DNA using a validated polymerase chain reaction (PCR) on a specimen obtained from a normally sterile site (e.g., blood or CSF) [1], or
- Evidence of *N. meningitidis* antigen by immunohistochemistry (IHC) on formalin-fixed tissue or latex agglutination of CSF.[2] (Positive antigen test results from urine or serum samples are unreliable for diagnosing meningococcal disease.)

3. *Confirmed* : A clinically compatible case **AND** isolation of *Neisseria meningitidis* from a normally sterile site (e.g., blood or cerebrospinal fluid [CSF] or, less commonly, synovial, pleural, or pericardial fluid) or skin scrapings of purpuric lesions.

Note:

Isolation of *N. meningitidis* from sputum in the absence of symptoms consistent with invasive disease should not be reported.

[1] Mothershed EA, Sacchi CT, Whitney AM, Barnett GA, Ajello GW, Schmink S, Mayer LW, Phelan M, Taylor TH Jr, Bernhardt SA, Rosenstein NE, Popovic T. Use of real-time PCR to resolve slide agglutination discrepancies in serogroup identification of *Neisseria meningitidis*. *J Clin Microbiol* 2004;42:320–328.

[2] Guarner J, Greer PW, Whitney A, Shieh WJ, Fischer M, White EH, Carlone GM, Stephens DS, Popovic T, Zaki SR. Pathogenesis and diagnosis of human meningococcal disease using immunohistochemical and PCR assays. *American Journal of Clinical Pathology* 2004;122(5):754–64.

C. Close Contacts (of a person with meningococcal disease)

Meningococcal disease spreads by direct contact with infectious respiratory secretions and by droplet transmission. Such droplets generally travel 3 feet or less when an infected person talks, coughs, or sneezes. The risk of transmission of *N. meningitidis* is a function of multiple factors including clinical features of the source case as they relate to communicability (e.g., presence of cough), proximity and duration of contact, ventilation, and use of appropriate infection control measures (mask). Consult with a CDES epidemiologist as needed on a case-by-case basis regarding determinations of close-contacts.

Examples of close contact with meningococcal patients include:

1. Direct face-to-face contact with a symptomatic case-patient during the contagious period. This includes household and immediate family members, boyfriends/girlfriends, and child care contacts (those who spend many hours together or sleep under the same roof).
2. An obvious exposure that involves direct contact with respiratory, oral, or nasal secretions from a case-patient during the contagious period (e.g., a cough or sneeze in the face, sharing eating utensils, sharing water bottles, kissing, mouth-to-mouth resuscitation, or performing intubation or nasotracheal suctioning without a mask). Health care workers who have not had direct contact with the case's nasopharyngeal secretions are *not* at increased risk, and prophylaxis is *not* indicated.
3. Close proximity for a prolonged period of time with a case-patient during the contagious period. Risk of droplet exposure increases with longer duration and closer proximity of contact.

   Examples of persons who may be at increased risk include:

   a. non-household close friends or other social contacts
   b. some passengers during shared transportation
   c. some contacts at community activities or at the place of employment
   d. some healthcare workers caring for a case without wearing a mask
   e. children attending an after-school care group or play group on the same days

   Note: Close contact does not include activities such as walking by a person or briefly sitting across a waiting room or office.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

Meningococcal disease is most commonly diagnosed by isolation of *N. meningitidis* from blood or cerebral spinal fluid (CSF). After administration of any antibiotics, sensitivity of bacterial culture can be low. In this situation, a Gram stain of CSF, assays to detect bacterial antigen in CSF, and polymerase chain reaction (PCR) tests for *N. meningitidis* DNA can be helpful.

B. Services Available at the Washington State Public Health Laboratories (PHL)

Under Washington state law, all isolates of *N. meningitidis* obtained from patients with invasive meningococcal disease must be submitted to PHL. Once received, PHL confirms the identification and serogroups isolates of *N. meningitidis*. PHL does not perform PCR for *N. meningitidis* on blood or CSF specimens, or latex agglutination on CSF specimens. All isolates are routinely tested for resistance to sulfa antibiotics and rifampin at PHL.

5. ROUTINE CASE INVESTIGATION

Interview the case (or parent/guardian) or, as necessary, close family members or others who may be able to provide pertinent information.

A. Evaluate the Diagnosis

Review the clinical history, physical exam findings and laboratory results. Conduct a public health investigation for all confirmed, probable, and suspect cases.

B. Identify Potential Sources of Infection and Potentially Exposed Persons

Identify all persons who had close contact (see Section 3C) with the case, and events (e.g., parties, sporting event, resuscitation) where close contact occurred during the 10 days prior to case onset until 24 hours after initiation of appropriate antibiotics. Obtain the name, address, and telephone number of exposed persons. Date of birth, weight, and any history of allergies will also be needed if chemoprophylaxis is to be provided.

Identifying the source of infection is often not possible, because of the high percentage of people who carry the organism. It is useful to ask whether any household, child care, or other close contact has recently had an illness suggestive of meningococcal disease. However, clusters of meningococcal disease are rare, even among household members of cases.

Persons who had close contact with the case during the 7 days prior to onset until 24 hours after initiation of appropriate antibiotics should be offered prophylaxis. Additionally, persons with obvious exposures (such as kissing) during the 8–10 days prior to case onset may also be considered for prophylaxis. Contacts exposed most recently should be prioritized for chemoprophylaxis since the incubation period is usually less than four days. In general, chemoprophylaxis should be recommended to contacts whose last exposure occurred within the 10 days prior to *the current date* since most secondary cases will occur within 10 days (incubation period). According to the CDC, chemoprophylaxis administered more than 14 days after the case onset is probably of limited or no value (MMWR 2005;54[RR-7]:16).

C. Environmental Evaluation

Generally, none, although in outbreak settings an investigation may be warranted to identify environmental factors (e.g., disinfection practices, ventilation patterns, etc.) that may favor droplet transmission.

6. CONTROLLING FURTHER SPREAD

A. Infection Control Recommendations

In addition to standard precautions, hospitalized patients should be cared for using droplet precautions until at least 24 hours after initiation of effective antibiotic treatment.

B. Case Management

Some of the antibiotics commonly used for treatment do not reliably eradicate nasopharyngeal colonization. Unless ceftriaxone or ciprofloxacin (which are effective against colonization) were used, the patient should also be given chemoprophylaxis to eliminate carriage before hospital discharge (see Table 1).

C. Contact Management

1. Symptomatic Contacts

Contacts with symptoms compatible with meningococcal disease (fever, rash, lethargy, irritability, headache, stiff neck, vomiting, and rash) should be referred to a health care provider immediately for evaluation.

2. Antibiotic Prophylaxis

Chemoprophylaxis should be recommended for all household members and other exposed persons (see Section 5B). Since contacts are at highest risk of becoming ill immediately after the onset of the case, prophylaxis should be initiated as soon as possible, ideally less than 24 hours after identification of the index patient. Chemoprophylaxis is not recommended for persons who have had only brief or casual contact with the case. If such persons are anxious about their exposure, they should be advised that their risk of disease is extremely low (see section 4 Education below).

Rifampin, ciprofloxacin, and ceftriaxone are all appropriate drugs for chemoprophylaxis (see Table 1). They are 90–95% effective in reducing nasopharyngeal carriage of *N. meningitidis.*

Rifampin is the drug of choice for most children. *Rifampin is not recommended for pregnant women.* Those taking rifampin should be informed that the following side effects can occur: gastrointestinal upset, orange discoloration of urine, discoloration of soft contact lenses, and decreased effectiveness of oral contraceptives.

Ciprofloxacin can be used for chemoprophylaxis of persons 18 years and older. *Ciprofloxacin is not recommended for pregnant women.*

Ceftriaxone can be used for children and adults (including pregnant women) to eradicate nasopharyngeal carriage if rifampin is contraindicated.

Table 1: Schedule for administering chemoprophylaxis against meningococcal disease

Drug	Age group	Dosage	Duration and route of administration*
Rifampin[†]	**Children aged <1 mo**	**5 mg/kg body weight every 12 hrs**	**2 days**
	Children aged ≥1 mo	**10 mg/kg body weight every 12 hrs (max 600 mg/dose)**	**2 days**
	Adults	**600 mg every 12 hrs**	**2 days**
Ciprofloxacin[§]	**Adults (≥18 yrs old)**	**500 mg**	**Single dose**
Ceftriaxone	**Children aged <15 yrs**	**125 mg**	**Single IM dose**
	Adults	**250 mg**	**Singe IM dose**

* Oral administration unless indicated otherwise.

[†] Not recommended for pregnant women because it is teratogenic in laboratory animals. Because the reliability of oral contraceptives might be affected by rifampin therapy, consideration should be given to using alternative contraceptive measure while rifampin is being administered.

[§] Not usually recommended for persons aged <18 years or for pregnant women and lactating women because it causes cartilage damage in immature laboratory animals. Can be used for chemoprophylaxis of children when no acceptable alternative therapy is available. Recent literature review identified no reports of irreversible cartilage toxicity or age-associated adverse events among children and adolescents (Source: Burstein GR, Berman SM, Blumer JL, Moran JS. Ciprofloxacin for the treatment of uncomplicated gonorrhea infection in adolescents: does the benefit outweigh the risk? Clin Infect Dis 2002;35:S191–9).

Source: MMWR 2005;54(RR–7):1–21

3. Immunization

Vaccination may be useful when a significant outbreak of disease due to serogroup A, C, Y, or W135 is *continuing* in a defined population (e.g., a school, institution, or community) (see Section 7 Managing Special Situations). Vaccination is not recommended to protect contacts of sporadic cases.

4. Education

Potentially exposed persons should be instructed to watch for symptoms (fever, rash, lethargy, irritability, headache, loss of appetite, stiff neck, or vomiting) regardless of whether nor not prophylaxis is recommended, and instructed to seek medical care immediately should such symptoms develop. Anxiety may be reduced if persons exposed 10 or more days prior to the current date are educated about the symptoms of invasive meningococcal disease and instructed to see a health care provider any time symptoms of meningococcal disease develop.

7. MANAGING SPECIAL SITUATIONS

A. Case Attends a Child Care Facility

If the child has attended any such facility during the week before onset, then within 24 hours of the initial report:

1. Interview the operator of the child care facility to determine whether other cases of meningococcal disease occurred among attending children or staff during the past 90 days.
2. Notify the parents of children who are in the same classroom as the case (preferably in writing) of the occurrence of meningococcal disease in the facility. The notice should advise parents to seek chemoprophylaxis for their attending children without delay.
3. Advise parents to watch their children carefully for a 10 day period after the index case was last present in the child care center for signs of illness, especially high fever, and to seek medical care immediately if illness should occur.
4. Instruct the child care operator to notify the LHJ immediately if another person becomes ill with symptoms of meningococcal disease.
5. Recommend chemoprophylaxis to all staff in the ill child's classroom. Children and staff in other rooms are usually not at elevated risk, and therefore do not need chemoprophylaxis in most instances. However, it should be determined if children from multiple classrooms spend time together in one room at the beginning and/or end of the day.

B. Multiple Cases in a Defined Population within a 90 Day Period

Vaccination with MPSV4 or MCV4 is recommended to control meningococcal outbreaks caused by serogroups A, C, Y and W-135. An outbreak is defined as three or more primary cases of meningococcal disease with the same serogroup that occur in a defined population (e.g., a school, institution, or community) within a 90-day period resulting in an attack rate of $\geq$10 cases/100,000 population. Vaccination should also be considered if two or more primary cases of meningococcal disease with the same serogroup occur in a defined population and the attack rate exceeds 10/100,000 (MMWR 2005;54[RR-7]:14–15).

8. ROUTINE PREVENTION

A. Immunization Recommendations

Two quadrivalent vaccines are licensed in the United States; meningococcal conjugate vaccine (MCV4) and meningococcal polysaccharide vaccine (MPSV4). Both vaccines are effective in providing protection against serogroups A, C, Y, and W-135, but neither is protective against meningococcal disease cause by serogroup B.

The meningococcal conjugate vaccine (MCV4) (Menactra™) is licensed in the United States for use among persons aged 2–55 years. This vaccine has a longer duration of protection and similar efficacy compared to MPSV4 in adolescents and adults. The vaccine is given as a single intramuscular injection and is recommended for the following:

- All adolescents aged 11–18 years at the earliest opportunity. Persons aged 11–12 years should be routinely vaccinated at the 11–12 year healthcare visit.
- Persons aged 2–55 years who have elevated risk for meningococcal disease:
    - College freshmen living in dormitories
    - Microbiologists who are routinely exposed to isolates of *N. meningitidis*
    - Military recruits
    - Persons who travel to or reside in countries in which *N. meningitidis* is hyperendemic or epidemic, particularly if contact with the local population will be prolonged
    - Persons who have anatomic or functional asplenia or terminal complement component deficiencies (an immune system disorder)

The meningococcal polysaccharide vaccine (MPSV4) (Menomune™) was licensed in the United States in 1978 and is given subcutaneously as a single dose. The vaccine is generally not protective in children less than 2 years of age. Although it provides good short-term (3–5 years) protection (85%) in older children and adults, antibody levels decrease markedly after 2–3 years, especially in children. Therefore, people at high risk need revaccination every 3–5 years. It is recommended for the following:

- Individuals aged over 55 years who are at elevated risk (see MCV4 recommendations for list of groups at elevated risk)
- If MCV4 is unavailable, MPSV4 is an acceptable alternative for persons at elevated risk ages 11–55 years

For additional information on the use of the meningococcal vaccines, please see:

Centers for Disease Control and Prevention. Prevention and Control of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP) (MMWR 2005;54[RR-7]:1–21) (MMWR 2007;56:794–5).

B. Prevention Recommendations

In addition to immunization, persons should practice "respiratory etiquette" or good health manners to stop the spread of respiratory pathogens.

Persons can keep respiratory pathogens to themselves by:

- Covering the nose and mouth with a tissue when sneezing, coughing or blowing the nose.
- Throwing out used tissues in the trash as soon as possible.
- Always washing hands after sneezing, blowing the nose, or coughing, or after touching used tissues or handkerchiefs.
- Washing hands often when sick.
- Using warm water and soap or alcohol-based hand sanitizers to wash hands.
- Staying home if coughing and febrile.
- Seeing a doctor as soon as possible if coughing and febrile, and following their instructions, including taking medicine as prescribed and getting lots of rest.

- If requested, using face masks provided in doctors' offices or clinic waiting rooms.

Persons can keep pathogens away by:

- Washing hands before eating, or touching eyes, nose or mouth.
- Washing hands after touching anyone else who is sneezing, coughing, blowing their nose, or whose nose is running.
- Not sharing things like cigarettes, towels, lipstick, toys, or anything else that might be contaminated with respiratory germs.
- Not sharing food, utensils or beverage containers with others.

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UPDATES

December 2007 Revisions

Section 3B: CDES now requests that meningococcal pneumonia cases be reported as suspect rather than confirmed cases.

Section 3C (1-3): Revisions were made to the examples of close contact.

March 2008 Revisions

Section 3B: Isolation of *N. meningitidis* from sputum in the absence of symptoms consistent with invasive disease should not be reported.

Section 5B: Revisions were made to guidance around prophylaxis of close contacts.

May 2008 Revisions

Section 8A: Recommendations for meningococcal conjugate vaccine updated.